

the *Nereis infusoria*, the females, at a certain phase of their sexual cycle, poured into the vessel in which they were kept traces of a special substance which he called "fertilizin"; and it was further observed by Just that when the male organisms of the same species were placed in the water in which such "fertilizin" was present, they at once began to emit sperm. It is thus clear that in these organisms, which are extremely responsive to the water in which they swim, sexual behavior is entirely dominated by chemical stimuli from the environment.

If in lower organisms, sexual behavior thus has a chemical basis and explanation, then why not in higher ones as well, in both their psychic and physical manifestations? Loeb believes that this is the case and that higher organisms are as mechanistically determined by the internal chemical environment of their blood as the *Nereis infusoria* is by its external one. In animals and human beings, sexual reactions arise from chemical stimuli of this internal environment and consists of alterations of blood chemistry by hormones produced by the gonads and other glands, as well as by toxins and metabolic end-products resulting from the substances that enter our bodies in the form of food and become part of the blood.

In addition, there are other environmental stimuli which determine sexual responses, as special odors given off by the body during mating seasons or when under the influence of strong erotic desire. Here we have a phenomenon similar to the chemotropism (chemical tropism), or automatic sexual responses of the infusoria. The influence of hormones and toxins in the human blood, in determining sexual behavior, is of a similar nature. Loeb believes that all the physiological and psychological manifestations of sexuality in man can be accounted for on a similar chemotropic basis, as mechanistically determined reflexes and responses to chemical and physical stimuli.

According to Loeb's tropistic theory, the concept of "instinct" and "will" can have no place in scientific biology, since all actions of the organism are "tropisms" or forced responses to stimuli. He defines tropism as an "automatic orientation in a field of force, toward or away from the center of the force." This force may be mechanical, gravitational, chemical, or electrical. In any case, the organism automatically reacts to stimuli acting upon it, responding to them in a determined, mechanistic manner. Under such conditions there can be no talk of voluntary decision of instinct, just as there cannot be in the case of a machine.'

In his book *Forced Movements, Tropisms, and Animal Conduct*, Loeb presents evidence in favor of his theory that all the actions of the animal (and human) organism are determined by external and internal (hormonal, etc.) stimuli, and that the concept of purposiveness in behavior and free will must be completely discarded and replaced by one of automatic reactions in terms of the quantitative laws of mechanical causation. However, rather than make man a slave of sexual impulses, this conception enables him to become their master. For he does have free will in determining to which type of stimuli he will permit himself to be subjected; and by selecting the desired stimuli, he can control the resulting sexual responses accordingly.

The term, "forced movements," has been borrowed by Loeb from brain physiology and applied by him to animal behavior in general. It designates the fact that certain animals are no longer able to move in a straight line when certain parts of the brain are injured, but are compelled to deviate constantly toward one side. The explanation of these forced movements is that on account of the